

REMARKS/ARGUMENTS

This is in response to the Office Action dated April 14, 2008. Claims 1-22 are pending. Claims 1-22 stand rejected in the outstanding Office Action. Claims 1, 14 and 15 have been amended.

The rejection of claims 1, 14 and 15 under 35 U.S.C. § 103(a), as allegedly being unpatentable over Inoue (US 6,850,309) in view of Mosier (US 5,489,918), is respectfully traversed.

Amended claims 1, 14 and 15 now recite “the drive voltage setting section sets a drive voltage in accordance with viewing angle characteristics of the liquid crystal panel, thereby controlling viewing angle characteristics, and *switches between wide viewing angle characteristics and narrow viewing angle characteristics*”. Support can be found, for example, in page 45, line 12 to page 46, line 4 of the specification. Inoue in view of Mosier fails to teach this limitation.

Inoue discloses an LCD device, wherein one of the two substrates enclosing the liquid crystal material comprises a plurality of projections. In one embodiment, each pixel contains a first projection 20 and a second projection 21, which is shorter than the first projection (Fig. 8). The first projection is used as a spacer between the two substrates, whereas the second projection is used to help orient the liquid crystal molecules in a certain direction. For example, when the applied voltage is zero, the liquid crystal molecules 9, having a negative dielectric anisotropy, are oriented almost perpendicular to the substrates, slightly tilted due to the presence of the second projection 21 (Fig. 8a). On the other hand, when a voltage is applied, as shown in Fig. 8b, the liquid crystal molecules become inclined along the slope of the second projection 21. As a result, the liquid crystal molecules 9 are inclined in two directions, obtaining a wide viewing

angle, col. 9, line 44 to col. 10, line 14. The Examiner acknowledged that Inoue does not disclose a drive voltage section which sets a drive voltage in accordance with viewing angle characteristics of the liquid crystal panel, thereby controlling viewing angle characteristics. He then turned to Mosier for the missing limitation.

Mosier generally discloses a method for compensating for varying brightness problems in an LCD device associated with varying viewing angle. In other words, in typical LCD panels, as the off-axis viewing angle increases, brightness of the pixel will change from the brightness when viewed on-axis. In Mosier's method, the voltage applied to each pixel has the form shown, for example, in Fig. 15 (bottom waveform), col. 18, lines 13-23. The magnitude and slope of the voltage waveform is adjusted based on the particular compensation needs. For example, if it is known that the LCD will be at a certain angular orientation to the viewer, the magnitude and slope of the ramp 98 can be pre-adjusted (col. 19, lines 1-11), based on specific luminance vs. voltage curves similar to those shown in Figs. 3 and 4 (col. 19, line 6 to col. 20, line 19). Thus, the voltage applied across the pixel changes in accordance to the desired value of the transmittance. The liquid crystal material in Mosier's LCD is of the twisted nematic type (col. 1, lines 27-28).

The Examiner argued that it would have been obvious to use the voltage driving technique disclosed by Mosier to the VA-type LCD device of Inoue "in order to compensate for a variety of operational factors which degrade display performance", citing Mosier, col. 7, lines 1-3, 20-25.

With the amendment to claims 1, 14 and 15, it is made clear that appropriate voltage control of the drive voltage setting section can result in the LCD device exhibiting either wide or narrow viewing angle characteristics. In contrast, the LCD device of Inoue, which would

allegedly be used by incorporating the voltage driving method of Mosier, is structured in such a way so that it provides wide viewing angle characteristics only. Inoue teaches that the existence of the second (shorter) projections 21 affects the inclination of the liquid crystal molecules so that “the liquid crystal molecules 9 are inclined in two directions, obtaining a wide viewing angle”, col. 10, lines 13-14. In other words, because of the structure of the liquid crystal panel, e.g., incorporating projections 21 in a pixel area, the orientation of the liquid crystal molecules is forced to assume a certain orientation. This would preclude orientation yielding narrow viewing angle mode. The LCD structure of Inoue is designed to yield wide viewing angles, as opposed to conventional TN-mode liquid crystal panels having a narrow viewing angle (col. 1, lines 27-37 in Inoue).

An exemplary embodiment presented in the present application uses liquid crystal operating in the vertically aligned mode which has a wider viewing angle characteristics than liquid crystal operating in the twist nematic (TN) mode. This realizes switching between viewing angle characteristics on a display screen by changing contrast and grayscale expressing capability of a liquid crystal panel, taking advantage of excess brightness on the lower end of grayscale (on the side of black display) at the oblique viewing angle and grayscale degradation (in a severe case, grayscale inversion) on the higher end of grayscale (on the side of white display) at the oblique viewing angle, which are demerits of liquid crystal operating in the vertically aligned mode.

That is, the exemplary embodiment uses a liquid crystal panel having unique display characteristics, and controls the range of viewing angle characteristics by taking advantage of such display characteristics of the liquid crystal panel.

Inoue, which does not disclose the feature of switching between wide viewing angle

characteristics and narrow viewing angle characteristics, does not utilize the demerits of the liquid crystal operating in the vertically aligned mode in order to realize switching between the two modes.

In addition, Mosier utilizes characteristics of the TN-mode liquid crystal panel (see Figs. 3 and 4). Therefore, it is impossible to perform the viewing angle control, as claimed, by applying the invention of Mosier to Inoue's liquid crystal panel operating in a vertically aligned mode, which has completely different characteristics from the TN mode.

For the above reasons, claims 1, 14 and 15 are allowable.

It is respectfully requested that the rejection of claims 2-13, 16-22, each one being dependent from claim 1 or 15, also be withdrawn.

In view of the foregoing and other considerations, all claims are deemed in condition for allowance. A formal indication of allowability is earnestly solicited.

The Commissioner is authorized to charge the undersigned's deposit account #14-1140 in whatever amount is necessary for entry of these papers and the continued pendency of the captioned application.

KUBO, M.
Appl. No. 10/811,306
July 9, 2008

Should the Examiner feel that an interview with the undersigned would facilitate allowance of this application, the Examiner is encouraged to contact the undersigned.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: /Leonidas Boutsikaris/
Leonidas Boutsikaris, Ph.D.
Reg. No. 61,377

LB:tlm
901 North Glebe Road, 11th Floor
Arlington, VA 22203-1808
Telephone: (703) 816-4000
Facsimile: (703) 816-4100